

## Review

### Wound management: a literature review

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*Accepted for publication 20 August 1997*

#### Summary

- This paper provides an overview of literature on wound management, including wound assessment and wound care and their relationship to the healing process.
- No attempt is made to describe individual tools or dressing materials as this literature can be found elsewhere.
- Patient and economic benefits of accurate wound assessment and choice of dressing material are highlighted.
- The case for an improved and updated nursing knowledge base regarding all aspects of wound care is made.

**Keywords:** wound assessment, wound dressings, wound management, wound measurement.

#### Search parameters

The literature review for this paper used the following databases: CD ROM MEDLINE & CINAHL (1984–96) and BIDS EMBASE (1992–96). The keywords employed were ‘tissue viability’, ‘skin viability’, ‘tissue survival’, ‘cell survival’, ‘regional blood flow’, ‘wounds and injuries’, ‘wound assessment’, ‘wound care’, ‘wound healing’ and ‘wound management’. Only literature published in English was considered. There was a vast literature of which a large proportion was devoted to animal studies. What was surprising in relation to the literature was the very limited number of clinical studies related to general surgical, postoperative wound healing and our bibliography reflects this lack of recent

work. Reports of studies in nursing were almost always descriptive in nature, with little information on the actual samples employed, or studies were so small as to be almost meaningless. The result is that the few available studies, limited as they are in scope and design, are widely quoted.

#### Introduction

The practice of wound management has seen much change over the past decade:

- scientific evidence has led to changes in wound management from dry to moist wound healing (Bolton *et al.*, 1990);
- there is a preponderance of new and varied wound care products available on the market;
- there is greater acceptability of a particular type of product to suit individual patients’ life styles.

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Lazarus *et al.* (1994) estimate annual world-wide expenditure on wound care to be in the region of \$7 billion (US). Therefore the implications of efficient and effective wound healing are massive for both the patient and the economy.

There has been a proliferation of wound care-related literature advocating systematic approaches to and standardization of wound care. This activity is evidenced by the emergence of specialist wound care journals, 30 000 references on CD ROM bases, the emergence of RCN specialist wound groups, tissue viability groups within and across trust hospitals, wound protocol groups and wound specialist nurses.

### Nursing and wound management

Wound management is a multidisciplinary concern, although it is usually seen as the responsibility of nursing (Sutton, 1989). Carr (1993) states that, as nurses are the professionals most involved in the management of wounds, they need to be able to report changes accurately and contribute to discussions on continued care.

However, as noted earlier, much of the nursing literature appears to be descriptive in nature, with few clinical trials reported and offering little evidence of the validity and reliability of the tools designed (e.g. Jaber, 1986; Morison, 1987; Mather & Woods, 1987; Sutton, 1989; Carroll & Johnson, 1991; Flanagan, 1994).

The nursing literature focuses on the following areas: wound assessment (Sutton, 1989; Dealey, 1991a; Banfield & Shuttleworth, 1993); wound measurement (Kundin, 1989; Dealey, 1991b; Anthony, 1993); dressing choice (Griffiths, 1991; Bolton *et al.*, 1990; Bolton & Rijswijk, 1991); evaluation of wound progress (Dealey, 1991c); and recommendations for a systematic approach to wound management (Bale, 1991; Griffiths-Jones, 1991; Banfield & Shuttleworth, 1993).

Bryant (1992), whilst praising this new enthusiasm for wound care, cautions against wound management becoming an end in itself rather than managing the total care of the patient.

### Assessment

It has been stated that formal assessment of wound status is a prerequisite for good wound care (Gould, 1984), in that assessment enables nurses to set realistic and measurable goals (Banfield & Shuttleworth, 1993). Sutton (1989, p. 71) is of the view that 'accurate assessment is vital to planning appropriate care and evaluating its effectiveness'. Generally it is agreed that there is a need for continuity and consistency in the assessment of patients with wounds. Gould

(1984) argues that the further assessment and planning of treatment should be individualized. This holistic approach to wound care is considered by Bale (1991), Johnson (1993), Flanagan (1994) and Benbow (1995) to be of great importance. Morison (1987) believes that assessment is facilitated by a systematic and reliable tool.

#### PURPOSE OF WOUND ASSESSMENT

Lazarus *et al.* (1994, p. 490) state that 'assessment of a wound in the environment in which it occurs is essential for diagnosis, treatment, management and study'. Flanagan (1994) identifies four purposes:

- 1 to monitor the progress of wound healing;
- 2 to evaluate the effectiveness of planned treatment/intervention;
- 3 to improve the morale of both patients and staff;
- 4 to provide a valuable teaching tool for patients, staff and carers.

This supports the work of Dealey (1991a), who believes that wound assessment with patient assessment has two main aims: the first is to provide baseline information to enable progress to be monitored, the second is to enable the appropriate selection of dressings.

Bolton & Rijswijk (1991, p. 147) state that nurses must remember that a wound is attached to a patient and that the aim of assessing a wound is to 'restore biochemical balance by identifying and removing the cause of tissue breakdown'. Carr (1993) emphasizes the importance of a sound knowledge of the healing process and the ability to recognize the stage of wound healing. She is also of the opinion that before a wound can be assessed, its history has to be ascertained; i.e. the origin of the wound, the patient's general condition, the patient's nutritional status in relation to wound healing, and whether there are complicating factors, e.g. diabetes.

Griffiths-Jones (1991) states that assessment occurs at two levels. The first level is an understanding of what is happening within the wound environment itself, while the second level is the effect the wound has on the patient and family. This information should be collected in a systematic way which progresses through four stages (Griffiths-Jones, 1991):

- 1 collection of objective information from nursing and medical notes;
- 2 patient interviews;
- 3 observation and measurement of the wound;
- 4 identification and validation of actual or potential problems.

Lazarus *et al.* (1994) are of the opinion that assessment should commence with the extent of the wound, followed

by attributes such as blood flow, oxygenation, infection, wound metabolism and innervation. These factors are clues to cause, pathophysiology and wound status but ultimately, they suggest, wounds should be assessed by their effect on the host.

Cutting & Harding (1994) are of the view that wound infection rates may well be higher than reported. They believe that the traditional criteria used to assess the presence of infection, e.g. pus or pus with inflammation, may be too narrow to account for the ways in which infection may manifest itself, e.g. in granulating wounds. They feel that inadequate criteria lead to patients being discharged with unrecognized signs of wound infection. They advocate that the assessment of factors such as delayed healing, discolouration, friability, unexpected pain, smell and wound breakdown be added to the traditional criteria of abscess, cellulitis and discharge.

#### A BRIEF CRITIQUE OF WOUND ASSESSMENT TOOLS

Although there is much consistency in the content of wound assessment tools, e.g. wound and patient factors, Sutton (1989, p. 68) notes a lack of 'clearly established standards for assessing and documenting wound progress'. Morison (1987) attempted to establish criteria which took into account the intrinsic and extrinsic factors that might affect healing, including parameters that indicate wound status. Any tool, she stated, must be easy and quick to use, highlight the possibility of infection and be applicable to a wide range of wounds.

However, Sutton (1989) identified that some wound characteristics are easier to assess than others and her published assessment chart concentrates on factors which can be seen or measured by a nurse, such as the presence of infection. In an earlier work, Cuzzel (1986) noted that the guidelines she had developed did not take cognizance of factors that might affect a patient's resistance to infection or affect wound healing, as these were not readily measurable. Consequently, Cuzzel employed objective, descriptive criteria that would indicate effectiveness of treatment.

#### VALIDITY OF CHARTS IN USE

The charts described by Jaber (1986), Morison (1987), Mather & Woods (1987), Sutton (1989) Carroll & Johnson (1991) and Flanagan (1994), although using criteria adequately justified from a wound healing knowledge base and despite reported clinical use, have not been evaluated rigorously as evidenced by the literature. No large scale studies could be found which supported the validity and reliability of any of the previously mentioned assessment charts.

Kundin (1989, p. 207), in describing her wound gauge, states that 'in clinical trials the instrument has proved safe and correlates well with standard methods of measurement'. She does not, however, proceed to describe these trials.

In the main, papers outline a chart or protocol that has been designed or is in use, without quantifying its effectiveness; otherwise studies are on a very small scale which precludes generalizing findings. Sutton (1989), for example, could only sample five patients due to problems with time and access, yet her work is widely quoted and referred to in secondary sources. As a further example, Banfield & Shuttleworth (1993) concentrate on the process of introducing their wound assessment chart rather than documenting any beneficial effects on wound care.

#### Wound measurement

Wound measurement is often seen as an integral part of wound assessment. Wound measurement is viewed as objective evidence of wound progress compared with descriptive statements such as 'healing well' or 'wound satisfactory' (Dealey, 1991b). Change in the surface area of an open wound is seen as a useful measure of wound status according to Morison (1987), who emphasizes the point that initially wound size may increase as eschar is removed and healing tissue uncovered. Flanagan (1994) believes it important to keep accurate visual records of changes in an open wound's surface area to determine its status.

#### WOUND MEASUREMENT TOOLS

The tools available for the measurement of the surface area of a wound are described as either invasive or noninvasive, depending on the level of intervention required by the technique to obtain the data. The level of patient intervention required and the potential resultant wound damage may preclude the regular clinical use of certain available wound measurement tools, e.g. biopsies, liquid capacities or moulds.

There are several noninvasive techniques such as ultrasound, magnetic resonance or stereophotometry (Lazarus *et al.*, 1994). More clinically accessible, however, are linear measurement and acetate tracing (Anthony, 1993). Morison (1989) discusses the inherent inaccuracies in using two-dimensional representations of three-dimensional wound surfaces, but she argues that in most instances change in wound size, rather than absolute size, is sufficient. This is also seen as sufficient by Bjellerup (1996). Lazarus *et al.* (1994) recommend measurements using both invasive and noninvasive techniques and other mechanisms that estimate wound attributes such as blood supply or innervation.

Thomas & Wysocki (1990) state that when choosing a wound assessment tool, the following questions should be asked:

- 1 Is the purpose of measurement clinical evaluation or research?
- 2 What funds are available to purchase equipment?
- 3 How critical is measurement of actual wound area versus an index of wound healing?
- 4 How much time does the user have to accomplish measurement?
- 5 What type of records of the wound are needed?

The easiest and least interventionist method and probably the method in most common use is the wound ruler. Use of a ruler has been described by Mather & Woods (1987), Sutton (1989) and Dealey (1991b).

#### NONINVASIVE TECHNIQUES

Wound rulers are used for measuring length and greatest width, while wound depth can be measured by the use of a probe, which is then set against a wound ruler. A simple method of wound measurement is tracing, as described by Morison (1987) and Dealey (1991b). Tracing involves using acetate paper or an occlusive dressing and measuring the dimensions of the wound when traced by pen on to paper. This method is seen by Thomas & Wysocki (1990) as being the most accurate measure of wound area. Kundin (1989) has developed what she considers to be a safe and efficient tool for wound measurement, i.e. a disposable gauge for measuring wound volumes designed to simulate a right-handed, Cartesian co-ordinate system and calculate size using a simple mathematical formula. Dealey (1991b) states that every nurse should be able to measure a wound but feels that a simple measurement or tracing is usually sufficient to monitor progress.

#### IDEAL FREQUENCY OF WOUND MEASUREMENT

The frequency of wound measurement is a further focus of nursing interest. Not all writers recommend an ideal timing for wound measurement. Rather, 'regular intervals' are suggested. Morison (1987) states that although other parameters such as the presence of discolouration or discharge should be measured at every dressing change, measurement only need be undertaken weekly. Similarly, weekly measurement is thought by Bale (1991) and Flanagan (1994) to be sufficient to show progress in healing, providing other parameters are observed at every dressing change. Banfield & Shuttleworth (1993) feel that monthly measurement is sufficient, unless otherwise indicated by a deteriorating or poorly healing wound, but no evidence is given to support this assertion.

#### Wound classification

Wound classification results from wound assessment. There are several methods whereby wounds can be classified. However, Flanagan (1994, p. 78) is of the opinion that wound classification confuses nursing knowledge, resulting in 'inconsistencies in practice'. For example, wounds can be classified according to injury and subdivided into one of two main groups such as acute – surgical or traumatic wounds – or chronic – ulcers or pressure sores. Flanagan (1994) feels this is not necessarily a helpful classification as the condition of the wound is not indicated. She stresses that an understanding of the physiology of healing is necessary if assessment and classification are to be done accurately. Benbow (1995) concurs with this view.

Turner (1991) sees wound classification as an issue of problem solving and provides three questions the practitioner should ask following assessment:

- At what stage is this wound?
- What do I want this wound to do next?
- How can I achieve this objective without damaging healthy tissue?

#### CLASSIFICATION ACCORDING TO CLINICAL APPEARANCE

Wounds may also be classified according to depth and the amount of tissue loss, for instance partial thickness or full thickness, or clinical appearance in relation to the stage of healing such as that provided by Turner (1991) and Benbow (1995):

- 1 black necrotic,
- 2 infected,
- 3 yellow sloughy,
- 4 granulating,
- 5 epithelialising.

The above format has been condensed with the introduction of a three-colour coding system (RYB) by Marion Laboratories Inc. based on the work of the 'Three Colour Concept' (Loughry, 1992) and the 'RYB Colour Code' (Cuzzell, 1988). It is a simple classification method whereby the predominant colour of the wound is used to assess and then guide treatment. 'R' is the colour red and indicates a healthy, healing wound. 'Y' is yellow and this type of wound is deemed infected and characterized by slough. 'B' is black and indicates necrosis.

#### Choosing a dressing

Griffiths-Jones (1991) states that choosing the correct dressing for a wound at the different stages of healing is very difficult in that, as they have become more sophisticated, dressings have become more wound specific and the

sheer volume of possible materials make choice difficult (Turner, 1991). Turner (1985 in Turner, 1991, p. 26) believes that 'no single dressing is suitable for the management of all types of wounds and few are ideally suited for the treatment of a single wound during all stages of the healing process'. Griffiths (1991) agrees with this statement and stresses that no patient and no wound or healing time will be identical to any other. Bolton & Rijswijk (1991, p. 158) state that 'while the basic healing needs of all wounds are similar, their specific depth, area and pathology needs vary'.

Griffiths-Jones (1990) cites the work of Murray (1988) who found that nurses were biased towards products with which they were familiar and which they liked using. Nurses justified using inappropriate dressing material by the lack of up to date knowledge of moist healing. Griffiths-Jones (1991) suggests that the lack of knowledge-based practice may be due, in part, to nursing literature appearing to concentrate on matching particular wounds to particular dressings or policies. Nurses, she believes, struggle with 'the rising tide of new dressings now on the market' (1991, p. 208), often at the expense of the patient's perspective on their care.

Bolton *et al.* (1990) states that although knowledge of wound healing is still quite limited, it is known that cells participate in the healing process and that cells must survive to function. Utilizing this knowledge they describe two ways in which dressings, by 'helping cells', can exert effects on healing. These effects are termed 'passive' and 'interactive'. Passive effects are described as actions that protect the wound from drying and trauma and create the correct physiological environment for optimal cell function. Interactive effects are described as dressing materials interacting with molecules present in the wound to promote cellular activity.

The shift to moist wound healing and the understanding that traditional wound care products do little to actively aid healing are seen as important advances in wound management, although Bolton *et al.* (1990) are of the opinion that there is much to learn about how dressings aid cell function and 'propel' the healing process. The so-called 'smart dressing' is soon to make its debut (University of Glasgow, 1995).

#### THE IDEAL DRESSING

New occlusive dressing materials concentrate on creating the correct environment for wound healing to occur. The ideal dressing is described by Griffiths (1991, p. 86) as being one that provides 'a moist environment; is comfortable for the patient; removes any necrotic material; promotes the production of granulation tissue; stimulates

re-epithelialization' and is cost-effective. Bolton & Rijswijk (1991, p. 146) state that for optimal results 'the wound dressing must not only meet the clinical needs of both patient and nurse, but also the wound's physiological and biochemical needs'. They believe that a dressing should fulfil the following functions:

- conformability, particularly with uneven body surfaces
- pain control
- odour control
- cost effectiveness
- safety
- aid healing
- convenience
- environmental acceptability
- quality of life, restores normal daily activities.

(Bolton & Rijswijk, 1991)

Not only do these clinical needs have to be met but the specific physiological and biochemical requirements of a wound should be addressed, such as exudate management, debridement, microbial barrier, antimicrobial, compression and adherence (Bolton & Rijswijk, 1991).

Thorough patient and wound assessment are necessary to establish patient variables and wound characteristics before choosing the appropriate dressing (Turner, 1991). Turner (1991) evaluated wound care using three dressing materials and three cleaning solutions which could be chosen according to a management flow chart. On the basis of her work, Turner suggests that:

If nurses can recognize the various stages of healing, understand which stage in the healing process comes next and know the performance characteristics of various dressings, it should then be possible to make the appropriate dressing choice which should facilitate healing of almost any viable wound. (1991, p. 27)

Bolton & Rijswijk (1991) state that with proper assessment and diagnosis, the choices for appropriate wound care become clearer. From their review of the pathophysiology of wound healing and summary of the literature on clinical trials of dressing materials, Bolton & Van Rijswijk (1991) argue that if underlying problems with healing are not dealt with even 'ideal dressings' will be unable to heal them. Similarly, Porter (1992), who related the properties of commonly used dressings to treatment requirements of open skin defects, is of the opinion that no dressing has been sufficiently proven to accelerate healing. He argues that at best dressings can create optimal conditions for healing:

If a wound fails to heal, expensive dressing materials are a waste of money if the root cause of the problem is not diagnosed and corrected. (Porter, 1992, p. 12)

Bolton & Van Rijswijk (1991) and Porter (1992) argue that more research is needed into the way dressings work in

healing wounds in human subjects as opposed to experimental animals. They emphasize that more work on wound healing is carried out in the laboratory as opposed to on human subjects. Our review of the literature to date would support that assertion. Bolton & Rijswijk (1991, p. 158) also state that although the basic healing needs of wounds are similar, specific needs vary and 'dressings should be selected that meet these needs as determined by controlled scientific research on healing wounds'.

### Evaluation of healing

Evaluation of wound care aims to measure the effectiveness of that care. Dealey (1991c, p. 32) says that evaluation of progress is important, as is a recognition that 'as a wound moves towards healing, it may be appropriate to change the type of dressing in use'. Griffiths-Jones (1991) states that evaluation may consist of objective data based on observation and measurement of the wound, tools having been previously identified in the planning stage. She also feels that subjective data, including the patient's feelings and nurse's intuition and past experience, are of equal importance. Griffiths-Jones (1991) is of the opinion that evaluation often concentrates on physical aspects of wound care at the expense of the psychological. She believes that the two components are inseparable and 'nursing should have a commitment to both' (1991, p. 212). Therefore a balance should be achieved by involving the patient in all stages of the wound care process.

Lazarus *et al.* (1994) state that the evaluation of healing requires analysis of both quantitative and qualitative wound assessments. They are of the opinion that the simplest way to evaluate healing is to examine the healed wound and decide if it is minimally, acceptably or ideally healed. This can be done using a history, physical examination and may require objective, quantifiable data. They note that evaluating the healing process is far more complicated as it is a dynamic process requiring frequent, systematic and consistent evaluation within defined parameters and appropriate frequency of evaluation. Modes of evaluating progress may include assessment of a variety of factors including angiogenesis, inflammation, wound contraction and epithelialization. Lazarus *et al.* (1994) suggest that this information, together with information achieved through history and physical examination, provides a good indication of progress.

Dealey (1991c) emphasizes two points. First, the need to alter treatment should be only as a result of evaluation of wound progress and, second, particularly with chronic wounds, healing may be a slow process and wound care should allow for this.

### Systematic approaches

Both Bale (1991) and Griffiths-Jones (1991) support a holistic approach to wound care which is patient-centred. Bale argues (1991, p. 208) that with much multidisciplinary interest and involvement in wound care it is important for nurses 'to strengthen their role if they are to be heard with equal force'. In Griffiths-Jones' view, the nursing process provides a format that can help nurses structure wound care around the needs of individual patients and their problems and releases nurses from reliance on general wound care policies. Griffiths-Jones (1991) adds that by involving the patient, facilitation of the setting of realistic goals and the potential for complete and effective care is increased. As she points out, the steps of the process are ideal for nurses faced with the complex issues often presented by a patient with a wound.

### Conclusion

From the literature it would appear that a systematic approach to wound management is advocated. The approach should also be holistic, in that it is generally accepted that wounds should not be treated in isolation. Wounds come with patients and there may be factors present within the patient that may affect healing such as diabetes, ischaemia or nutritional problems.

These factors will also require attention if healing is to take place, even though it may be delayed because of them. The assessment process is the foundation of good wound management. This includes both patient and wound assessment and may or may not include measurement of the wound surface area. Measurement of wound area at regular intervals is generally deemed to be important. This may not be exact, but the ability to show progression is equally important. There are invasive and noninvasive methods of measurement. It is generally felt that use of a simple ruler is sufficient. Choice of dressing is aided by a systematic approach. Understanding by practitioners that wound care is dynamic and that evaluation of wound status and changing of dressing materials are needed as appropriate is vital.

### Acknowledgements

The authors wish to thank the Chief Scientist Office, Scottish Office, for support in funding this work.

### References

